REMARKS

REQUEST FOR INTERVIEW

This is to confirm applicant's request last week for an interview once Examiner Barry has had a chance to review the Response, Supplemental Response, and this 2nd Supplemental Response, all for the Office Action of August 16, 2001. It is applicant's understanding that Examiner Barry will call to indicate his availability once he has reviewed the responses.

Per kind suggestion of Examiner Barry, the interview(s) will initially be by phone, with an "office" interview to be requested by applicant if necessary.

CLAIMS

Status of Claims

Prior to this Amendment

Pending: claims 1-16 and 19 and 20.

Cancelled: claims 17 and 18.

After this Amendment

Pending: claims 1-8, 10-16, 19, 20, and 22-71.

Cancelled: claims 9, 17, 18 and 21.

Support for Amendments/New Claims

Claims 1-14 and 16 - the language of claims 1, 2, 3, and 16 has been amended to more clearly conform to language in the specification (i.e., replacement of "at least one" with "a"), and the language of several of the dependent claims has been amended to correct informalities.

Claims 15, 19 and 20 - have been amended to recite a sludge composition. Support can be found throughout the specification, including the Abstract, and at col. 4, line 40 to col. 6, line 43.

Claims 22-40 - recite a method of treating sludge. Support can be found throughout the specification, including the Abstract, and at col. 4, line 40 to col. 6, line 43.

Claims 41-71 - recite various sludge compositions. Support can be found throughout the specification, including the Abstract, and at col. 4, line 40 to col. 6, line 43.

Brief Summary of Claims

To assist in the understanding of the claims, a brief summary of the claims is provided.

Independent claim 1 and dependent claims 2-8, 10-14 and 16, recite a method.

Independent claim 15 and dependent claims 19 and 20, recite a composition.

Independent claim 22 and dependent claims 23-32, recite a method.

Independent claim 33 and dependent claims 34-40, recite a method.

Independent claim 41 and dependent claims 42-47, recite a composition.

Independent claim 48 and dependent claims 49-54, recite a composition.

Independent claim 55 and dependent claims 56-61, recite a composition.

Independent claim 62 and dependent claims 63-66, recite a composition.

Independent claim 67 and dependent claims 68-71, recite a composition.

RESPONSE TO SUBSTANTIVE REJECTIONS

Introduction - Significance of the Invention

The year 1993 witnessed a paradigm shift in water treatment, with the promulgation of the the National Sewage Sludge Use and Disposal Regulation (40 C.F.R. § 503).

Prior to 1993, water treatment plants employed mesophyllic bacteria. These bacteria were favored, because they were active at ambient temperatures of the water treatment plant. Therermophilic bacteria would require heating, which of course adds cost/time to the water treatment process. Thus, while it might have been known that thermophilic bacteria could, be used in water treatment plants, it was not ever done because of the increased costs. Therefore, there was no real data on what process advantanges/disadvantages such thermophilic bacteria would cause (other than increased cost/time).

In fact, the prior art (Ort) actually suggested that thermophilic bacteria would be easy to dewater.

However, after 1993, under certain circumstances under § 503, water treatment plants would employ, thermophilic bacteria.

Thus, before 1993, water treatment plants employed mesophilic bacteria. After 1993, the conventional process was to employ mesophilic bacteria, and while by far the vast majority of water treatment plants still employed mesophyilic bacteria, a very small number of non-conventional plants were employing thermophilic bacteria.

The major distinction between mesophilic and thermophilic bacteria is that mesophilic bacteria naturally secrete a polysaccharide that is tackifying (i.e., clump them together),

whereas thermophiles lack such a polysaccharide and appear "buckshot" (i.e., scattered).[2] This tackifying polysaccharide encourages and helps promote a natural coagulation and a natural formation of microfloc of the mesophiles.

Thus, one difference between dewatering of mesophiles and thermophiles, is that mesophiles have the presence of this polysaccharide to encourages and helps promote a natural coagulation and a natural formation of microfloc of the mesophiles, whereas thermophiles lack such a polysaccharide. Thus, the mesophiles generally have a "head start" in coagulation and formation of microfloc.

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[2] As explained in some detail in the "Response to Office Action Mailed 12/04/00."

Rejection Under 35 U.S.C. § 103(a) - Ort, Allied Colloid, and Kurita:[3]

Claims 1,2, 4, 10, 12-14, 16, and 19 stand rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Ort, Allied Colloid, and Kurita. The rejection is respectfully traversed.

Ort

Ort was filed in 1976, that is, prior to 1993, and at a time when conventional water treatment facilities employed mesophyllic bacteria.

Regarding digestion, Ort teaches, advantages of using thermophilic as opposed to mesophilic digestion, one of which is easier dewatering.

Specifically, Ort teaches, "the digestion process in both stage 1 and stage 2 tanks may be operated either mesophilically (approximately 40C) or thermophilically (approximately 60C), but thermophilic operation has certain advantages including a lower solids retention time (SRT) and the thermophillic sludge usually dewaters more readily." Ort, col. 4, lines 15-21.[4]

As for dewatering, Ort teaches using mechanical dewatering devices ("including centrifuge, vacuum filter or pressure filter," col 5, lines 7-8), and does not disclose or suggest that there are any deficiencies with mechanical dewatering that should be addressed. As for any coagulating, flocculating or thickening, Ort teaches a two step process of (1)

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3 As the claims have been substantially rewritten and a large number of new claims added, applicant will treat all rejections as applying to all claims.

4 Please note, that Ort is not suggesting the use of "thermophilic" digestion in a water treatment facility.

"mechanical thickening" followed by a "cone press." (col. 5, lines 7-11). Ort does not criticize nor suggest limitations of this two step process, and in fact prefers it (col. 5, line 7). Thus, one reading Ort would be taught that dewatering using "mechanical thickening" and a "cone press" was not only sufficient but preferred.

The claims distinguish Ort at least as follows:

Independent claim 1, and by dependency, claims 2-8, 10-14, and 16, all distinguish Ort at least by the required "adding a polymeric quaternery....." or "adding a polyacrylamide...."

Claim 15 and by dependency claims 19 and 20, all distinguish Ort at least by they required "polymeric quaternery....." or "polyacrylamide...."

Independent claim 22, and by dependency claims 23-32, all distinguish Ort at least by the required "adding a polymeric quaternary ammonium compound and a polyacrylamide to the sludge."

Independent claim 33, and by dependency claims 34-40, all distinguish Ort at least by the required "adding to the sludge a polymeric quaternary ammonium compound."

Independent claims 41, 48, 55, and 67 and by dependency on their respective independent claims, dependent claims 42-47, 49-54, 56-61, and 68-71, all distinguish Ort at least by the required "polyacrylamide" or "polymeric quaternary ammonium compound."

Independent claim 62, and by dependency claims 63-66, all distinguish Ort at least by the required "copolymer comprising moities of quaternary ammonium and acrylamide monomer."

Allied Colloid

Allied Colloid claims priority back to 1991, that is, prior to 1993, and at a time when conventional water treatment facilities employed mesophyllic bacteria.

Allied Colloid discusses a "conventional process for treating raw sewage" on page 3, and although silent regarding the issue, applicant respectfully offers that such "conventional process" would be mesophillic (because the document priority date 1991 predates 1993).

As for dewatering, Allied Colloid teaches "[i]t is well known to add a flocculant material to a suspension so as to cause the suspended material to flocculate before solids-liquids separation" (page 1, lines 8-10).

Allied Colloid also teaches, "[a]lthough it is well known, as a generality, to use a polymeric flocculant to flocculate a suspension before subjecting it to a solids-liquids separation process there is still a very large amount of skill required in selecting optium polymeric materials and use conditions for particular processes" (page 1, lines 30-35, emphasis added).

Regarding the specifics of the Allied Colloid invention, Allied Colloid teaches "it is possible to improve sewage treatment processes by adding a [low molecular weight] cationic polymer followed by the anionic colloidal material. . . ." (page 4, lines 1-3) and optionally by adding a "higher molecular weight cationic polymer . . . to act as a bridging flocculant" (page 6, lines 16) (later called "further polymeric flocculant", see, page 6, line 29).

As for the specific low molecular weight cationic polymer, Allied Colloid teachs a number of large classes of compounds, including,

natural cationic polymer such as chitosan (page 4, line 21);

modified natural cationic polymer such as cationic starch (page 4, line 22);

preferably an organic synthetic polymer that is substantially water soluble and that is formed by polymerizing one or more ethlyenically unsaturated monomers, in general acrylic monomers, that consist of or include cationic monomer (page 4, lines 23-27).

suitable cationic monomers are dialkylaminoalkyl (meth) acrylates and dialkylaminoalkyl (meth) acrlyamides, either as acid salts or preferably as quaternary ammonium salts (page 4, lines 27-30);

"particularly preferred" (monomers) are dialkylaminoethyl (meth) acrylates, dialkylaminoethyl (meth) acrylamides and dialkylaminopropyl (meth) acrlyamides, either as acid salts or preferably as quaternary ammonium salts (page 4, lines 27-30);

Under the category of "various other cationic polymers that may be used are listed:

cationic amphoteric polymers (page 4, line 37-page 5, line 1);

polyethylene imines (page 5, line 5);

dicyandiamide polymers (page 5, line 5);

polyamine epichlorhydrin polymers (page 5, line 6);

polymers of diallyl monomers such as diallyl methyl ammonium chloride (DADMAC), either as homopolymers or copolymer with acyrlamide or other comonomer (page 5, lines 6-9).

As for the specific higher molecular weight bridging polymer, Allied Colloid teaches:

> preferably a polymer made from ethylenically unsaturated monomers as described above and having an IV of at least 4dl/g (page 6, lines 20-22).
>
> preferably however it is a non-ionic flocculant or an anionic flocculant . . . formed from an anionic monomer, for instance sodium acrylate or other carboxylic or sulphonic ethylenically unsaturated monomer, copolymerized with acrylamide or other suitable non-ionic copolymer (page 6, line 36 - page 7, lines 5).

Please note, there is no specific disclosure of the combination of "polymeric quaternary ammonium compound" and "polyacrylamide" for treating a thermophilic slude.

Allied Colloid is silent regarding dewatering of "thermophilic" sludge, or any problems with dewatering "thermophilic" sludge.

The claims distinguish Allied Colloid at least as follows:

Independent claim 1, and by dependency, claims 2-8, 10-14, and 16, all distinguish Allied Colloid at least by the required "adding . . . to the biological sludge" (the biological sludge being a "thermophilic" sludge).

Claim 15 and by dependency claims 19 and 20, all distinguish Allied Colloid at least by the required "biological sludge" (the biological sludge being a "thermophilic" sludge).

Independent claims 22 and 33, and by dependency on their respective independent claims, dependent claims 23-32 and 34-40, all distinguish Allied Colloid at least by the required "contacting" or "adding to" the "sludge." (the biological sludge being a "thermophilic" sludge).

Independent claims 41, 48, 55, 62 and 67 and by dependency on their respective independent claims, dependent claims 42-47, 49-54, 56-61, 63-66, and 68-71, all distinguish Allied Colloid at least by the required "thermophiles."

Kurita

Kurita was published in 1976 (circa the Ort filing), that is, prior to 1993, and at a time when conventional water treatment facilities employed mesophyllic bacteria.

Kurita teaches a method "[e]sp[ecially] suitable for treating excess sludge, digested sludge, etc. generated in waste water treating plant." Again, although silent regarding the issue, applicant respectfully offers that such a "waste water treatment plant" would be mesophillic (because the document publication date 1976 predates 1993).

Kurita teaches treatment of waste water treatment sludge with an "(i) org[anic] polycationic c[om]p[oun]d. . . (ii) polyvalent metal salt and (iii) org[anic] polymer with high mol[ecular] w[eigh]t . . . selected from polyacrylamide, modified polyacrylamide and cation-modified polyacrylate."

While Kurita does disclose an "(i) org[anic] polycationic c[om]p[oun]d.," Kurita is silent regardingthe degree of the "poly"cationic compound (inventor Haase teaches the need to a "quaternary" compound).

Please note, there is no specific disclosure of a "polymeric quaternary ammonium compound," nor the combination of "polymeric quaternary ammonium compound" and "polyacrylamide" for treating any type of sludge (much less a thermophilic slude).

Kurita is silent regarding dewatering of "thermophilic" sludge, or any problems with dewatering "thermophilic" sludge.

The claims distinguish Kurita at least as follows:

Independent claim 1, and by dependency, claims 2-8, 10-14, and 16, all distinguish Kurita at least by the required "adding . . . to the biological sludge" (the biological sludge being a "thermophilic" sludge).

Claim 15 and by dependency claims 19 and 20, all distinguish Kurita at least by the required "biological sludge" (the biological sludge being a "thermophilic" sludge).

Independent claims 22 and 33, and by dependency on their respective independent claims, dependent claims 23-32 and 34-40, all distinguish Kurita at least by the required "contacting" or "adding to" the "sludge." (the biological sludge being a "thermophilic" sludge).

Independent claims 41, 48, 55, 62 and 67 and by dependency on their respective independent claims, dependent claims 42-47, 49-54, 56-61, 63-66, and 68-71, all distinguish Kurita at least by the required "thermophiles."

Discussion of Nonobviousness

After 1993, a new problem arose in some water treatment plants, that is, the dewatering of thermophilic sludge. As inventor Richard Haase determined, dewatering of thermophilic sludge presents an additional problem not presented by mesophilic sludge.

Specifically, mesophilic bacteria naturally secrete a polysaccharride that encourages and helps promote a natural coagulation and a natural formation of microfloc of the mesophiles, whereas thermophiles lack such a polysaccharide. Thus, the mesophiles generally have a "head start" in coagulation and formation of microfloc.

Regarding the combination of Ort, Allied Colloid and Kurita, the 8/16/01 Office action states:

> It would have been obvious to have employed the Allied Colloids process for separating biological solids from water in the thickening and/or dewatering steps of Ort because before the invention was made, Kurita gave the skilled artisan a reasonable expectation of success, namely, improved coagulation, increased filtering speed, improved quality of treated water, and high combustion (i.e., biodegradation) efficiency, of dewatering a "digested sludge," such as the thermophilic digested sludge of Ort, if-as suggest by Kurita - a combination of low molecular weight polyalkylene polyamine and a high molecular weight polyacrylamide or modified polyacrylamide were used."
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> 8/16/01 Office action at page 19.

In response, the following points are respectfully submitted.

1. The reference in Allied Colloid to "conventional process for treating raw sewage" and the reference in Kurita to "excess sludge, digested sludge, etc. generated in waste water treatment plant," must be read in light of the times

(i.e., the 1970's when water treatment facilities utilized "mesophilic" digestion) and would refer to "mesophilic" sludge.

2. Kurita at best discloses treatment of "mesophilic" sludge utilizing a "polycationic" compound, which could mean 2°, 3° or 4° nitrogen compounds. Kurita is silent regarding the criticality of using a quanternary amine.

3. From the teaching of Allied Colloid, one of ordinary skill would recognize that a "very large amount of skill" would be required to adapt any process of Allied Colloid from "mesophilic" to Mr. Haase's "thermophilic" sludge (See, Allied Colloid, page 1, lines 30-36, emphasis added) (while "is it well known, as a generality to use a polymeric flocculant to flocculate a suspension before subjecting it to a solids-liquids separation process there is still a very large amount of skill required in selecting optimum polymeric materials and use conditions for particular processes").

4. Ort, which is **post**-Kurita, is completely silent as for the need to utilize any chemical additives in dewatering. Thus, Ort seems to suggest that mechanical dewatering alone is sufficient to dewater both mesophilic and thermophilic sludges.

5. From the teaching of Ort (i.e., that "thermophilic" sludge dewaters more readily), it is not clear that a teaching for improving "mesophilic" sludge dewatering needs to be applied to a "thermophilic" sludge dewatering.

6. Even if Kurita could be read as suggesting employment of the Allied Colloid process to the "thermophilic" sludge of Ort, and in light of the Allied Colloid teaching that "a very large amount of skill [is] required in selecting optimum polymeric materials and use conditions for particular processes", the question would be out of all of the numerous combinations of low molecular weight cationic polymer[5] and higher molecular weight polymer[6], what would suggest

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5 Selected from among:
natural cationic polymer such as chitosan (page 4, line 21);

modified natural cationic polymer such as cationic starch (page 4, line 22);

preferably an organic synthetic polymer that is substantially water soluble and that is formed by polymerizing one or more ethlyenically unsaturated monomers, in general acrylic monomers, that consist of or include cationic monomer (page 4, lines 23-27).

suitable cationic monomers are dialkylaminoalkyl (meth) acrylates and dialkylaminoalkyl (meth) acrlyamides, either as acid salts or preferably as quaternary ammonium salts (page 4, lines 27-30);

the use of Mr. Haase's combination of polymeric quaternary ammonium amine and polyacrylamide?

7. And, even if Kurita could be read as suggesting employment of the Allied Colloid process to Ort, it would at most suggest employment of the Allied Colloid process to "mesophilic" sludge dewatering (because from Ort, "thermophilic" dewaters more readily).

8. It is thus respectfully submitted that the present invention is not obvious in view of Ort, Allied Colloid and Kurita.

"particularly preferred" (monomers) are dialkylaminoethyl (meth) acrylates, dialkylaminoethyl (meth) acrylamides and dialkylaminopropyl (meth) acrlyamides, either as acid salts or preferably as quaternary ammonium salts (page 4, lines 27-30);

Under the category of "various other cationic polymers that may be used are listed:

cationic amphoteric polymers (page 4, line 37-page 5, line 1);

polyethylene imines (page 5, line 5);

dicyandiamide polymers (page 5, line 5);

polyamine epichlorhydrin polymers (page 5, line 6);

polymers of diallyl monomers such as diallyl methyl ammonium chloride (DADMAC), either as homopolymers or copolymer with acyrlamide or other comonomer (page 5, lines 6-9).

6 Selected from among
preferably a polymer made from ethylenically unsaturated monomers as described above and having an IV of at least 4dl/g (page 6, lines 20-22).

preferably however it is a non-ionic flocculant or an anionic flocculant . . . formed from an anionic monomer, for instance sodium acrylate or other carboxylic or sulphonic ethylenically unsaturated monomer, copolymerized with acrylamide or other suitable non-ionic copolymer (page 6, line 36 - page 7, lines 5).

Rejection Under 35 U.S.C. § 103(a) - Ort, Allied Colloid, Kurita and Admitted Prior Art

Claim 3 stands rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Ort, Allied Colloid, and Kurita, as applied to claim 1 above, further in view of "admitted prior art.". The rejection is respectfully traversed

Ort, Allied Colloid and Kurita have been discussed above.

Regarding the "admitted prior art," at column 5, lines 4-10, applicant respectfully notes that these lines are found in the "Detailed Description Of The Preferred Embodiment" section of the patent, and are two preferred amines for applicant's invention, not an admission of the prior art.

Accordingly, this rejection is traversed.

Rejection Under 35 U.S.C. § 102 Allied Colloid, McGrow, or Chung

Claims 15 and 20 stand rejected under 35 U.S.C. 102(b) as being anticipated by Allied Colloid, McGrow or Chung. The rejection is respectfully traversed.

The claims distinguish Allied Colloid, McGrow and Chung, at least for the reasons as detailed above.

DISCUSSION OF FILE HISTORY

The '435 patent issued with claims 1, 2, 3, 15 and 16, which if the plural word "compounds" were to be read literally would seem to require at least two polymeric ammonium compounds. The singular "compound" was recited in claims 4-6, 8-10 and 12 (all dependent directly or indirectly on claim 1).

The Reexamination Office Action of 12/04/00 states, "[i]t appears more likely, therefore, that the disagreement in grammatical number between "compound" in dependent claims 4-6, 8-10 and 12 and "compounds" in claim 1, was due to an inadvertant error in the dependent claims rather than in the solitary independent claim 1." Office Action at page 7.

The Reexamination Office Action of 12/04/00 further states, "[f]rom this statement (regarding 'as primary component'), the public reviewing the '435 patent would have understood that applicant did not intend the expression 'primary component' to refer to only single compounds, but rather was a term open to a plurality of compounds. The plain language of claim 1 as originally filed supports this interpretation." Office Action at 7.

Applicant strongly disagrees with the above statements, and asserts that claims 4-6, 8-10 and 12 were not singular because of "an inadvertent obvious error," but rather were intended to be singular, and were correct as written. And, because of the prosecution history, original claim 1 would be correctly interpreted to be "singular" even in spite of the plural "compounds."

Applicant does agree that on its face, the claims of the '435 patent at least raise the issue of improper dependent claims, and thus a Reissue was filed.

As explained by applicant in the Reissue Application Declaration, he was led to believe by the patent attorney who filed and prosecuted the original patent application for the '435 patent that the use of a plural term covered "one or more" Unfortunately, this original patent attorney was not a native English speaker and was perhaps confusing the general rule in a "comprising" claim that the use of a singular generally encompasses more than one of that singular item.

According to M.P.E.P. § 608.01(n), claims 4-6, 8-10 and 12 should have on its face been objected to under 37 C.F.R. 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. It is respectfully noted by applicant that this is a formal matter, in that the claim should have been objected to not rejected, and applicant be given the chance to either cancel the dependent claim, amend the dependent claim, or rewrite the dependent claim in independent form.

Had the objection been properly made, applicant would have amended the claims to recite the singular form.

However, that is not what happened. This "improper dependent form" issue was not raised by applicant or Examiner during prosecution, and the patent issued with claims 4-6, 8-10 and 12, on their face appearing to be of improper dependent form for failing to further limit the subject matter of a previous claim.

It appears that both the prosecuting attorney and the Examiner believed the claims recited the singular or at least meant the singular.

In the Office Action/Restriction Requirement of 10/3/97, the Examiner states, "this

application contains claims directed to the following patentably distinct species of the claimed invention: The four biological sludge dewatering methods listed by applicant in the Abstract." Office action at 2.

For reference, the pertinent portion of the "Abstract" is as follows, and note that it recites the "singular" compound.

> By the first method, the polyquaternary amine is added directly, along with a cationic polyacrylamide, to the biological sludge. By the second method, the polyquaternary amine and an anionic polyacrylamide are added separately. By the third method, a quaternized polyacrylamide, having the polyquaternary amine as part of its polymer chain, is produced by copolymerization of acrylamide with monomers of polyquaternary amine quaternization and is added individually to the sludge. By the fourth method, the quaternized polyacrylamide from method three is added in concert with a cationic polyacrylamide to the sludge.

Thus, by reference to the Abstract, the Examiner appears to read the claims as reciting the singular compound.

In response to the Restriction requirement, the prosecuting attorney stated:

> By the first method, the polyquaternary amine is added directly, along with a cationic polyacrylamide, to the biological sludge. By the second method, the polyquaternary amine and an anionic polyacrylamide are added separately. Apparently, by the third method in the Abstract and according to claim 17, a quaternized polyacrylamide is added individually to the sludge. By the fourth method in the Abstract and according to claim 25, the quaternized polyacrylamide is added in concert with a cationic polyacrylamide to the sludge. Response at 1.

Thus, the prosecuting attorney recited the singular to the Examiner in discussing the claimed invention.

The applicant is also of the opinion that the public reviewing the '435 patent would

have understood that applicant did intend claims 1, 2, 3, 15 and 16 to encompass "at least one" compound, and would have interpreted claims 1, 2, 3, 15 and 16 to mean the singular. Support for this argument is found in the Reexamination Request of Requester Ciba Speciality Chemicals Corporation.

Ciba has a sufficient level of technical skill and access to talented attorneys, including patent attorney David R. Crichton, with a fairly seasoned registration number (37,300), who executed the Reexamination Request.

Specifically, in the Request, Requester Ciba makes numerous statements indicating a belief that the plural usage in claim 1 means singular, including for example, that "[i]n sum, claim 1 reads on any dual polymer sludge conditioning process in which a polymeric polyquaternary ammonium compound (a quaternized polymer) and a polyacrylamide are added to biological sludge."

REQUEST FOR ALLOWANCE

Prompt allowance of all claims is respectfully requested. Examiner Barry is kindly invited to contact applicant's attorney, Mark Gilbreth at 713/667-1200, or in his absence, patent agent Mary Gilbreth, Ph.D. at 505/747-3909, to discuss any matters in this proceeding.

Respectfully submitted,

Date: **March 1, 2002**

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